REMARKS

Claims 1-10 are pending herein. Claims 1 and 3 have been amended to correct minor informalities. New claims 7-10 have been added hereby to recite the subject matter of the multiple dependent claims that were cancelled in a Preliminary Amendment filed December 15, 2000. Attached hereto as page 9, pursuant to Rule 1.121(c)(1)(ii), is a marked-up version of the amended claims.

Applicants appreciate the PTO's indication that claims 2 and 3 would be allowed if rewritten in independent form in compliance with §112, second paragraph. For the reasons explained below, however, original independent claim 1 is believed to be allowable over the applied prior art.

1. Claims 1 and 5 were rejected under §103(a) over Minakata et al. (U.S. Patent No. 6,219,469) in view of McBrien et al. (U.S. Patent No. 6,341,031). This rejection is respectfully traversed.

The present invention is directed to a traveling wave optical modulator. Claim 1 recites that an optical waveguide substrate includes a thinner portion having a smaller thickness and a thicker portion having a larger thickness. First and second branched optical waveguide portions are formed at least on the thinner portion of the optical waveguide substrate. A set of electrodes is provided on at least the thinner portion of the substrate. A buffer layer is provided to cover a part of the optical waveguide portions at the thinner portion of the substrate. The electrodes cross on the buffer layer covering a part of the optical waveguide portions at the thinner portion of the substrate.

Minakata '469 (assigned to the same assignee as the present application) discloses a traveling-wave light modulator and process for producing optical waveguide devices. With reference to Figs. 1-3 of Minakata '469, an optical waveguide 2 includes branched portions

2c and 2d disposed on a main plane 1a of a substrate. A pair of opposed electrodes 3 and 4 are positioned on the substrate with branched portion 2d being sandwiched therebetween. A groove 7 is located in an opposed main plane 1b such that a thinned portion 12 is positioned beneath a portion of each electrode 3 and 4, and branched portion 2d.

There is no disclosure in Minakata '469 that at least a portion of both branched optical waveguide portions 2c and 2d are formed at least on thinned portion 12 of the optical waveguide substrate, as recited in claim 1. Rather, all of the drawings in Minakata '469 show that branched portion 2c is positioned ***only on*** the thickest portion of the substrate (shown more clearly in Fig. 3a).

Furthermore, there is no disclosure in Minakata '469 of a buffer layer covering part of optical waveguide portions at the thinner portion of the substrate, with electrodes crossing on the buffer layer. As explained in the present specification, the buffer layer feature of the present invention makes it possible to suppress the absorption loss of the light propagating through the optical waveguide, without adversely affecting the high-speed modulating characteristics of the optical modulator, or causing a DC drift (specification, paragraph 23).

To attempt to support the combination of Minakata '469 and McBrien '031, the PTO is arguing that one skilled in the art would make such a combination for the purpose of electrically connecting more than one optical waveguide branch to a high frequency signal circuit. However, even if the references were combined as asserted by the PTO, the combination would still fail to provide an optical modulator meeting the above-discussed "at least first and second branched optical waveguide portions formed at least on the thinner portion" and "buffer layer provided to cover a part of the optical waveguide portions... the electrodes crossing on the buffer layer" features recited in claim 1.

In view of the foregoing, reconsideration and withdrawal of the rejection of claims 1 and 5 under § 103 over Minakata '469 in view of McBrien '031 are respectfully requested.

2. Claims 4 and 6 were rejected under §103(a) over Minakata '469 in view of McBrien '031 and further in view of Brinkman et al. (U.S. Patent No. 6,167,169).

The deficiencies of Minakata '469 and McBrien '031 as attempted to be applied against claim 1 have been discussed above and apply equally to this rejection.

The PTO is apparently alleging that tapered waveguide segments disclosed in Brinkman '169 function as a buffer layer as recited in claim 4. With reference to Fig. 12 of Brinkman '169, an input beam 285 enters a tapered input waveguide segment 287 and exits through a tapered output segment 289. As is clear from the disclosure in Brinkman '169, the tapered waveguide segments are not buffer layers. As such, there is no disclosure in Brinkman '169 of a buffer layer provided to cover a part of the optical waveguide portions at positions, the electrodes crossing on the buffer layer. Therefore, the disclosure in Brinkman '169 adds nothing to supply disclosure lacking in the combination of Minakata '469 and McBrien '031, discussed above with respect to the rejection of claim 1.

Reconsideration and withdrawal of this rejection are requested.

For all of the foregoing reasons, Applicants respectfully submit that all pending claims herein are in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for this application in due course.

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

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Date

Kevin C. Brown
Reg. No. 32,402

KCB/SC/tlp

BURR & BROWN
P.O. Box 7068
Syracuse, NY 13261-7068

Customer No.: 025191
Telephone: (315) 233-8300
Facsimile: (315) 233-8320

1. (Amended) A traveling wave optical modulator comprising:

an optical waveguide substrate made of an electro-optic and ferrodielectric single crystal in the form of an X- or Y-orientation plate and comprising a thicker portion having a larger thickness and a thinner portion having a smaller thickness;

at least first and second branched optical waveguide portions formed at least on the thinner portion of the optical waveguide substrate;

a set of electrodes provided on at least the thinner portion of the substrate and adapted for applying voltage to ~~the~~at least said first and second optical waveguide portions to modulate a light propagating the optical waveguide portions; and

a buffer layer provided to cover a part of the optical waveguide portions at the thinner portion of the substrate, the electrodes crossing on the buffer layer.

3. (Amended) The traveling wave optical modulator set forth in claim 2, wherein each of said plural buffer layers has ~~such~~ a band-like shape ~~as~~ extending along the optical waveguide portion.

VERSION WITH MARKINGS TO SHOW CHANGES MADE
Amended claims

Abstract of the Disclosure

A traveling wave optical modulator includes an optical waveguide substrate made of an electro-optic and ferrodielectric single crystal in the form of an X- or Y-orientation plate. ~~and comprising~~ The substrate includes a thicker portion having a larger thickness and a thinner portion having a smaller thickness;. ~~f~~First and second branched optical waveguide portions are formed at least on the thinner portion of the optical waveguide substrate;. ~~a~~A set of electrodes are provided on at least the thinner portion of the substrate and are adapted for applying voltage to the first and second optical waveguide portions to modulate a light propagating the optical waveguide portions;. ~~and a~~A buffer layer is provided to cover a part of the optical waveguide portions at the thinner portion of the substrate, with the electrodes crossing on the buffer layer.

VERSION WITH MARKINGS TO SHOW CHANGES MADE
Amended abstract

Abstract of the Disclosure

A traveling wave optical modulator includes an optical waveguide substrate made of an electro-optic and ferrodielectric single crystal in the form of an X- or Y-orientation plate. The substrate includes a thicker portion having a larger thickness and a thinner portion having a smaller thickness. First and second branched optical waveguide portions are formed at least on the thinner portion of the optical waveguide substrate. A set of electrodes are provided on at least the thinner portion of the substrate and are adapted for applying voltage to the first and second optical waveguide portions to modulate a light propagating the optical waveguide portions. A buffer layer is provided to cover a part of the optical waveguide portions at the thinner portion of the substrate, with the electrodes crossing on the buffer layer.

Substitute abstract